

What is claimed is:

1. A method of making a self-supporting, pleated air filter using a fully automated process, comprising the steps of:

5 forming a plurality of pleats in a filter media extending along a front face and a rear face, the pleats comprising a plurality of pleat tips and sloping side surfaces generally perpendicular to a direction of pleating;

bonding at least one planar, first reinforcing strip oriented in a direction of pleating to the pleat tips on the front face of a filter media to form a pleated filter capable of machine handling;

10 positioning at least one reinforcing member in the pleats along the rear face of the pleated filter; and

cutting the pleated filter to size.

2. The method of claim 1 further comprising the step of applying  
15 frame members to the pleated filter.

3. The method of claim 1 wherein the step of positioning at least one reinforcing member comprises the steps of:

20 positioning the reinforcing member oriented in the direction of pleating to the rear face of a filter media prior to the step of forming a plurality of pleats; and

forming a plurality of pleats in the reinforcing member during the step of forming the pleats in the filter media.

4. The method of claim 3 comprising the step of bonding a planar  
25 second reinforcing strip oriented in the direction of pleating to the pleat tips.

5. The method of claim 3 wherein the pleats formed in the reinforcing member define reinforcing member pleat tips, the method comprising the

step of bonding a planar second reinforcing strip oriented in the direction of pleating to the reinforcing member pleat tips to form a truss structure.

5           6.     The method of claim 4 wherein each of the reinforcing member, the first reinforcing strip and the second reinforcing strip comprise a width of about 6.4 millimeters to about 25.4 millimeters.

10           7.     The method of claim 1 wherein the step of positioning at least one reinforcing member comprises the steps of:  
positioning a plurality of reinforcing members oriented perpendicular to the direction of pleating to the rear face of a filter media prior to the step of forming the pleats; and

forming a plurality of pleats in the reinforcing members during the step of forming the pleats in the filter media.

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8.     The method of claim 7 wherein the reinforcing member extends across at least one sloping side surface of a pleat.

20           9.     The method of claim 7 wherein the reinforcing member extends across at least one pleat.

10.    The method of claim 7 comprising the step of bonding a second reinforcing strip oriented in the direction of pleating to the pleat tips on the rear face.

25           11.    The method of claim 1 wherein the step of positioning the reinforcing member comprises the steps inserting the reinforcing member along at least one of the sloping side surfaces of the pleats on the rear face in a direction perpendicular to the direction of pleating after the step of forming the plurality of pleats in the filter media.

12. The method of claim 11 comprising the step of bonding a planar second reinforcing strip oriented in the direction of pleating to the pleat tips on the rear face over the reinforcing member.

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13. The method of claim 1 wherein the step of positioning the reinforcing member comprises positioning a planar scrim that extends across the rear face of the filter media.

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14. The method of claim 1 wherein the reinforcing member and reinforcing strips comprises one of films, scrims, strands or filaments constructed from paper products, metals, polymeric materials, or combinations thereof.

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15. The method of claim 1 comprising the step of bonding the reinforcing member to the filter media.

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16. The method of claim 1 wherein the step of applying the frame members comprises extending a portion of the frame members over distal ends of the reinforcing member.

17. The method of claim 1 wherein the step of applying frame members comprises the steps of:

applying side frame members to the pleated filter parallel to the direction of pleating; and

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applying end frame members to the pleated filter perpendicular to the direction of pleating.

18. The method of claim 1 wherein the step of pleating the filter media comprises the step of forming about 3 to about 6 pleats per 2.54 centimeters (1 inch).

5 19. The method of claim 1 wherein the step of pleating the filter media comprises the step of forming a pleat depth of about 25.4 centimeters to about 101.6 centimeters (1 inch to 4 inches).

10 20. The method of claim 1 comprising the step of forming a pleated air filter wherein the front face has a length and a width of about 30.5 centimeters by about 30.5 centimeters (12 inches x 12 inches) to about 50.8 centimeters by about 76.2 centimeters (20 inches x 30 inches).

15 21. The method of claim 1 comprising the step of selecting a filter media with a stiffness of at least 1.2 stiffness units.

22. The method of claim 1 comprising the step of selecting a filter media with a stiffness of at least 1.5 stiffness units.

20 23. A method of making a self-supporting, pleated filter, comprising the steps of:

bonding at least one reinforcing member oriented in a direction of pleating to a rear face of a filter media;

25 forming a plurality of pleats in a filter media and the reinforcing member along a front face and the rear face, the pleats comprising a plurality of pleat tips and sloping side surfaces generally perpendicular to a direction of pleating, the reinforcing member defining a plurality of reinforcing member pleat tips corresponding generally to the pleat tips;

bonding a planar first reinforcing strip oriented in the direction of pleating to the pleat tips on the front face to form a pleated filter;  
bonding a planar second reinforcing strip to the reinforcing member pleat tips on the rear face opposite the reinforcing member; and  
5 cutting the pleated filter to size.

24. The method of claim 23 further comprising the step of applying frame members to the pleated filter.

10 25. A method of making a self-supporting, pleated filter, comprising the steps of:

forming a plurality of pleats in a filter media along a front face and the rear face, the pleats comprising a plurality of pleat tips and sloping side surfaces generally perpendicular to a direction of pleating;

15 bonding a planar first reinforcing strip oriented in the direction of pleating to the pleat tips on the front face to form a pleated filter;

positioning at least one reinforcing members generally along at least one of the sloping side surfaces of the rear face and perpendicular to the direction of pleating;

20 bonding a planar second reinforcing strip oriented in the direction of pleating to the pleat tips on the rear face; and  
cutting the pleated filter to size.

26. The method of claim 25 further comprising the step of applying  
25 frame members to the pleated filter.

27. A method of making a self-supporting, pleated air filter using a fully automated process, comprising the steps of:

forming a plurality of pleats in a filter media extending along a front face and a rear face, the pleats comprising a plurality of pleat tips and sloping side surfaces generally perpendicular to a direction of pleating;

5 bonding a planar reinforcing scrim to the pleat tips on the front face of a filter media to form a pleated filter capable of machine handling;

positioning at least one reinforcing member in the pleats along the rear face of the pleated filter; and

cutting the pleated filter to size.

10 28. A self-supporting, pleated filter, comprising:

a filter media having a plurality of pleats defining a plurality of pleat tips and sloping side surfaces extending along a front face and a rear face, the pleat tips being perpendicular to a direction of pleating;

a reinforcing structure comprising;

15 a generally planar first reinforcing strip oriented in the direction of pleating bonded to the pleat tip along the front face;

a reinforcing member extending in the direction of pleating generally along the contour of the pleat tips and sloping side surfaces on the rear face, the reinforcing member having reinforcing member pleat tips; and

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a generally planar second reinforcing strip bonded to the reinforcing member pleat tips.

25 29. The article of claim 28 wherein the reinforcing member and reinforcing strips comprises one of films, scrims, strands or filaments constructed from paper products, metals, polymeric materials, or combinations thereof.

30. The article of claim 28 wherein the reinforcing member is bonded to the filter media.

31. The article of claim 28 wherein the frame extends onto a portion of the front face and the rear face.

5 32. The article of claim 28 wherein the perimeter of the filter media is adhesively bonded to the frame.

33. The article of claim 28 wherein the reinforcing member, first reinforcing strip and second reinforcing strip comprise a truss structure.

10 34. The article of claim 28 wherein the filter media comprises about 3 to about 6 pleats per 2.54 centimeters (1 inch).

15 35. The article of claim 28 wherein the pleats have a depth of about 25.4 centimeters to about 101.6 centimeters (1 inch to 4 inches).

36. The article of claim 28 wherein the filter media has a stiffness of at least 1.2 stiffness units.

20 37. The article of claim 28 wherein the filter media has a stiffness of at least 1.5 stiffness units.

38. The article of claim 28 comprising a frame extending around a perimeter of the filter media.

25 39. A self-supporting, pleated filter, comprising:  
a filter media having a plurality of pleats defining a plurality of pleat tips and sloping side surfaces extending along a front face and a rear face, the pleat tips being perpendicular to a direction of pleating;

a reinforcing structure comprising;

a generally planar first reinforcing strip oriented in the direction of pleating and bonded to the pleat tips along the front face; and

at least one reinforcing member oriented perpendicular to the direction of pleating and extending generally along at least one of the sloping side surfaces of the rear face.

40. The article of claim 39 wherein the reinforcing member and reinforcing strips comprises one of films, scrims, strands or filaments constructed from paper products, metals, polymeric materials, or combinations thereof.

41. The article of claim 39 wherein the frame extends over distal ends of the reinforcing member.

42. The article of claim 39 wherein the reinforcing member is bonded to the filter media.

43. The article of claim 39 comprising a frame extending around a perimeter of the filter media.

44. A self-supporting, pleated filter, comprising:  
a filter media having a plurality of pleats defining a plurality of pleat tips and sloping side surfaces extending along a front face and a rear face, the pleat tips being perpendicular to a direction of pleating;

a reinforcing structure comprising;

a generally planar scrim bonded to the pleat tips across the front face; and



**at least one reinforcing member oriented perpendicular to the direction of pleating and extending generally along at least one of the sloping side surfaces of the rear face.**